Overcoming Key Market Barriers
Biogas Development & Injection into Natural Gas Pipelines

Moving Renewable Gas into Microgrids

California Energy Commission

June 11, 2007

RealExperience

RealEnergy develops, owns and operates small, clean onsite generation systems

- Turnkey Projects – 43 Electrical Interconnections To-Date
- Reciprocating Engines, Solar PV, MicroTurbines, Hybrids
- BioGas Plant Injection into Natural Gas Pipeline to Fix Gas Cost for DG

- No Cost or Operating Risk to Host
- Clean/Green Power Priced Below Best Grid Price
- Immediate Economic and Environmental Benefits
- In-City Site Leases
    - 15 Year Site Lease
    - Commodity Sale Agreements
- On-Farm Site Leases
    - 15 Year Site Lease
    - Manure and Energy Crop Agreements

RealEnergy Developments

State of California
San Francisco

Arden Realty, San Diego, CA

CalSTRS, San Diego, CA

State of California
San Francisco

Arden Realty, Fountain Valley, CA

Walton/SCS Advisors,
Fremont, CA

State of California, Oakland

Emery Station

RealEnergy Developments

Ensemble, Long Beach, CA

KOR, Marina Del Rey, CA

Arden Realty, San Diego, CA

RREEF, Carlsbad, CA

CommonWealth Partners
Costa Mesa, CA

CommonWealth Partners
San Diego, CA

Arden Realty – Phase Two
Beverly Hills, CA

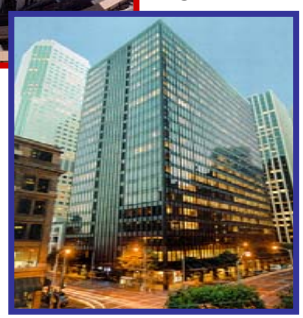
Arden Realty, Long Beach, CA

RealEnergy Developments

Tower Realty
San Francisco, CA

CommonWealth Partners, San Diego, CA

Trammell Crow
Torrance, CA



Fremont
Properties
San Francisco,
CA

Transwestern
So. California and New Jersey

Modular CHP Design Standard

Department of Energy Contract to Design:

- 300-1500kW modules
- Price/performance focused
- Technology agnostic
  - Reciprocating engines, microturbines
  - Natural gas, opportunity fuels
  - Chiller and balance of plant modules included
- MicroGrid recognized
  - Physical rules
  - Financial rules
  - Loading order
  - Billing/metering
  - Build/own/operator friendly

"Can small scale DG be mass produced with minimal customization (mass customization i.e. Dell computers), and achieve the price/performance demands of Wall Street?"

MicroGrid Design Standards

MicroGrids reduce capital cost and capture load diversity opportunities.

- Prime movers become larger, less expensive
- Fewer pieces of ancillary equipment
- Load diversity increases revenues
- Reduced site impact – one location vs. many

- Operation/maintenance cost reduced
  - Afford better monitoring/controls
  - Generally more reliable equipment
  - Single site vs. distributed sites

- Opens opportunities for the future
  - AC/DC buss for ground fault/firming renewables /PQ/ storage
  - Grids supporting grids require standards

CalPERS, San Diego, CA
RealEnergy MicroGrid

Biogas Injection Technical Standards

- North America ~ 200 Digesters, No BioGas Injection
- Europe ~ 5000 Digesters, BioGas Injection Since 2000
- Many Desire Standards for Distribution System Injection
  - Northwest Natural Gas
  - Southwest Gas
  - Pacific Gas and Electric
  - Intermountain Gas
  - Gas Technology Institute
  - American Gas Association
  - USCHPA
  - NYSEG
- No Quality Standards or Monitoring Protocols Yet
- European Community Standard as Strawman?

Gas Transport Tariff Example

ESTIMATED OF COST OF TRANSPORTATION FROM RICKREALL TO MADERA					
	Point to Point			**Estimated Charge**	
Origin : Received at : Received By : Transport By : Deliverd To :	Rickreall Dairy Rickreall (?) Northwest Natural Gas Northwest Natural Gas Salem (?)	[A]		$1.767392 ($/decatherm)	
Received At : Received By : Transport By : Deliverd To :	Salem (?) Williams (Northwest Pipeline Corp) Williams (Northwest Pipeline Corp) Stanfield (?)	[B]	TF-1	$0.882540 ($/decatherm)	Assumed to be the same as Transcanada
Received At : Received By : Transport By : Deliverd To :	Stanfield (?) Transcanada Pipelines Ltd. Transcanada Pipelines Ltd. GTN (GTN Mainline) Malin	[C]	FTS-1	$0.268985 ($/decatherm)	
Received At : Received By : Transport By : Deliverd To :	Malin Pacific Gas Transmission (PGT / PG&E) PGT (Line 400 Redwood Path On-System) PG&E Citygate	[D]	G-AFT	$0.314300 ($/decatherm)	
Received At : Received By : Transport By : Deliverd To :	Pacific Gas & Electric Citygate Pacific Gas & Electric Pacific Gas & Electric (Distribution) Any Delivery Point On-System (e.g. Madera)	[E]	G-EG	$0.266378 ($/decatherm)	
		Estimated Total Rate :		**$3.499595 ($/decatherm)**	

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Regulatory/Biogas Injection Roundtable

Napa Valley – April 19 & 20, 2007

- 165 General Regulatory Roundtable
- 46 Biogas Injection Roundtable
- Experience from Europe
  - Ros Roca (Spain, Germany)
  - Envitec (Germany)
  - Schmack Biogas (Germany)
- White Paper Draft by EPIC
  - "A Survey of Regulatory Challenges"

WWW.CABIOENERGY.COM

Key Market Barriers

- Waste
  - Anaerobic Digestion (AD) Considered Composting
  - No Clear Definition of AD Exists in California Law
  - AD Not Included in Exemptions/Exclusions
  - Feedstock's for AD are Considered Waste
  - Co-Digestion and Community Digestion
- Water
  - Salt Loading Rates and Management Practices
- Air
  - DG Emissions Standards to Reflect Biogas from Pipeline
  - Applicability of Waste Heat Credits
- Utility
  - Electric and Gas Interconnection Process, Standards and Costs
  - Net Metering - Level of Credits, Excess Power, Capacity Caps
  - Self Generation Incentive Program Eliminates Biogas Combustion in 2007
  - Injection Tariffs – Gas Technology Institute
- Private Equity
  - Investment Requires Clear Regulatory Compliance to Mitigate Risk
  - Appropriate and Advanced Technologies Need To Be Proven to Satisfy All Stakeholders/Shareholders

Short Term Actions That Can Work

- State Business Energy Tax Credit and Sale Option (Oregon)
- Self Generation Incentive Recognizing Biogas via Pipeline
- Industrial Development Bonds – SELP (Oregon)
- Expand Regulatory and Technology Transfer with Europe
- Develop Policy SWOT Team(s);
  - CoDigestion
  - Community Digestion
  - Salt Loading
  - Energy Crops
  - Microgrids
  - Gas Injection Specifications for Gas Distribution System
  - Quality Standards Protocols (Six Sigma Process)

Conclusion

California Public/Private cooperation is slowly creating a profitable and prolific biogas industry.

- Reliable Biogas Plants
- Safe Interconnections
- Cleaner Food Processing/Agriculture
- Reasonable Regulations
- Attainable Gas/Salt/Composting Standards
- Sustainable CHP Serving microgrids
- Energy Security
- Energy Risk Management
- Energy Efficiency
- Economic Growth
- A Better Environment

For More Information

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San Francisco,
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